SCREENING FOR HIGH BROMELAIN CONTENT IN DIFFERENT SPECIES OF PINEAPPLE IN MALAYSIA.

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The importance of the study:

- Bromelain in pineapple is known for it medical properties such as:
  - Anti-inflammation agent
    - Effective in relieving inflammation associated with infection and physical injuries. [9]
  - Help to promote and maintain proper digestion
    - Relieve symptom of stomach upset or heartburn [9]

OBJECTIVE

SO….

In order to promote the benefit of eating fresh pineapple, it is important **to screen for the highest bromelain concentration in various pineapple grown in Malaysia.**

SCOPES

- Identify pineapple species grown in Malaysia and potentially grown in Malaysia.
- Screen for bromelain and total protein content in flesh and stem of each species.

METHODOLOGY

- Analyses four (4) types of pineapple that can be easily found in Malaysia. They are:
  - Josapine
  - Gandul
  - Maspine
  - N 36

- Analysis that had been done are Gelatin Digestion Unit (GDU) test for bromelain concentration and Buiret Protein Assay for total protein.

PINEAPPLES

- Scientifically known as *Ananas Comosus M.*
- Contain : 81.2 – 86.2% moisture,

  13 – 19% total solid (glucose, sucrose, fructose)

TPYES OF PINEAPPLES FOUND IN MALAYSIA

- CANNING
  - N 36
  - GANDUL
  - MORIS
- FRESH
  - JOSAPINE
  - JOHOR 1
  - SARAWAK
  - CRYSTAL HONEY
  - MASPINE

- OTHER SPECIES OF PINEAPPLE
  - Nanas hijau
  - Moris gajah
  - Yan Kee
  - Giant India
  - Hana
  - Sleeping beauty

COMMERCIALLY GROWN PINEAPPLE

JOSAPINE

GANDUL

MASPINE

N 36

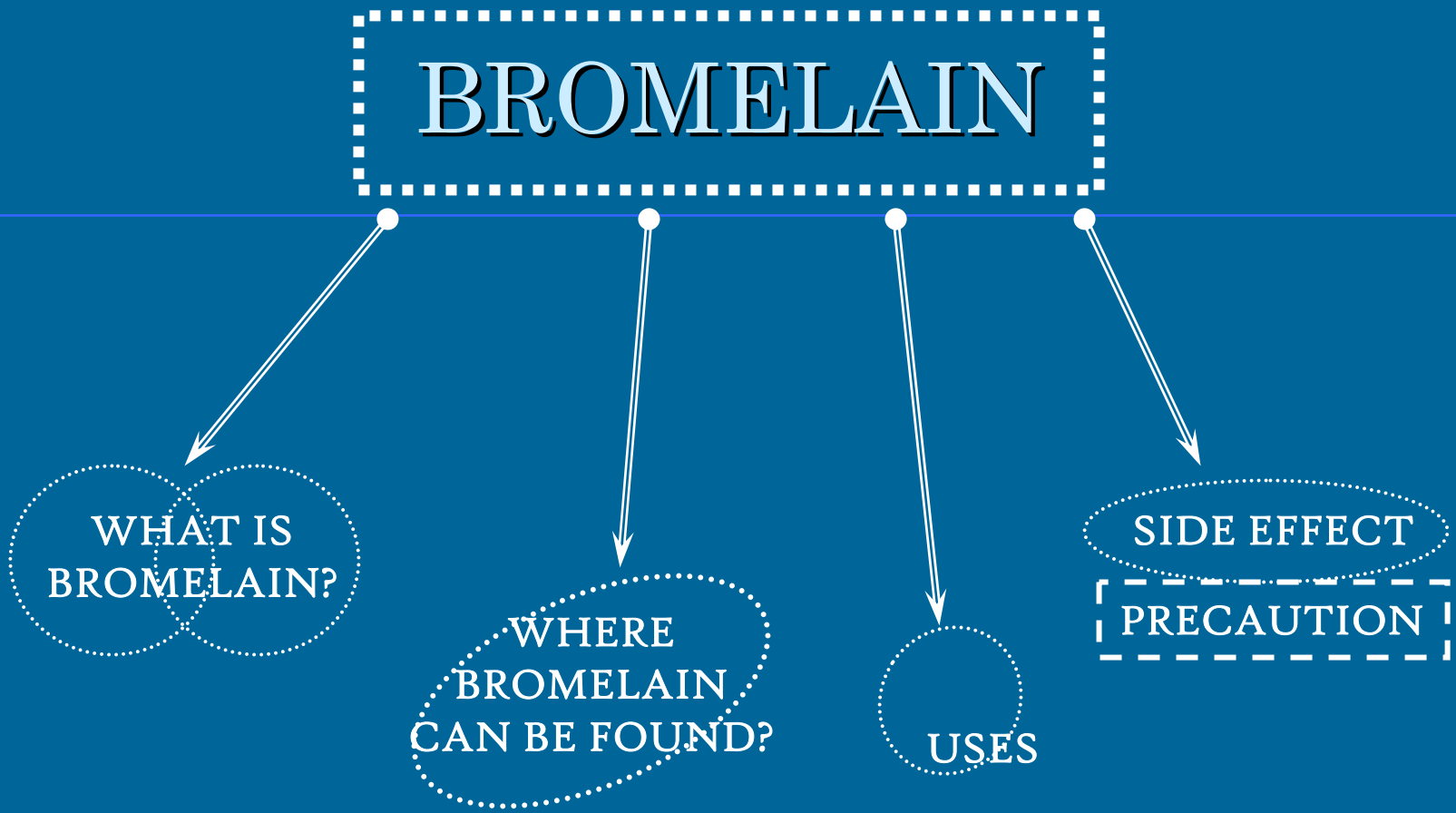
GENERAL NUTRITIONAL FACTS

Pineapple is a well known tropical fruit.

Its contain an enzyme called **bromelain**

COMPONENTS	EVERY 100g/ edible parts
Energy	45.0 calories
Moisture	87.8 g
Protein	0.5 g
Fat	0.1 g
Carbohydrate	10.6 g
Fiber	0.6 g
Ash	0.4 g
Calcium	24.0 mg
Phosphorus	6.0 mg
Beta carotene	270.0 µg
Vitamin B1	0.7 mg
Vitamin B2	0.8 mg
Niacin	0.1 mg
Vitamin C	15.2 mg

Source: Malaysian Food Nutrition Composition, IMR 1982


BROMELAIN
WHAT IS BROMELAIN?
WHERE BROMELAIN CAN BE FOUND?
USES
SIDE EFFECT
PRECAUTION

WHAT IS BROMELAIN ?

- A complex mixture of sulfur-containing protein-digesting enzymes called PROTEOLYTIC ENZYMES or PROTEINASES.[9]
- It is a crude, aqueous extract from the STEMS and IMMATURE FRUITS OF PINEAPPLES. [1]
- Contain small amount of: peroxidase, acid phosphatase, protease inhibitors and calcium. [9]

WHERE BROMELAIN CAN BE FOUND ?

- Usually found in ALL PARTS of the PINEAPPLE plant. [9]
- Mostly concentrated in the STEM. [9]
- Types of Bromelain found in pineapple:
  - From pineapple stem = stem bromelain, ananain, comosain.
  - From pineapple fruit = fruit bromelain. [1]

CLINICAL AND OTHER USES

- Most common uses : MEAT TENDERIZER and used in DIGESTIVE PROBLEM.
- Therapeutic benefits :
  - Reversible inhibition of platelet aggregation.
  - As an anti-inflammatory agent.
  - Bronchitis
  - Sinusitis
  - Surgical trauma

[1,2,3,4,9]

SIDE EFFECT

- Nausea
- Vomiting
- Diarrhea

with doses more than 1000 mg per day as recommended by the Germen Commission E (similar to the U.S. Food and Drug Administration

- Menorgghagia (excessively heavy menstrual flow)
- Possible allergic reaction
- Possible to increased heart rate (with doses up to 1840 mg)
- May interact with medications (antibiotic: tetracycline and blood thinning medications: aspirin and warfarin)

[1,2,3,4,9]

PRECAUTION

- Those who are allergic to pineapple should avoid consuming it because skin reactions and/or asthma-like symptom may occur.
- Bromelain supplement should only be taken under supervision of medical practitioners for those who are :
  - Pregnant
  - Individuals with bleeding disorders
  - Individuals with high blood pressure
  - Liver or kidney disease

[1,2,3,4,9]

METHODOLOGY

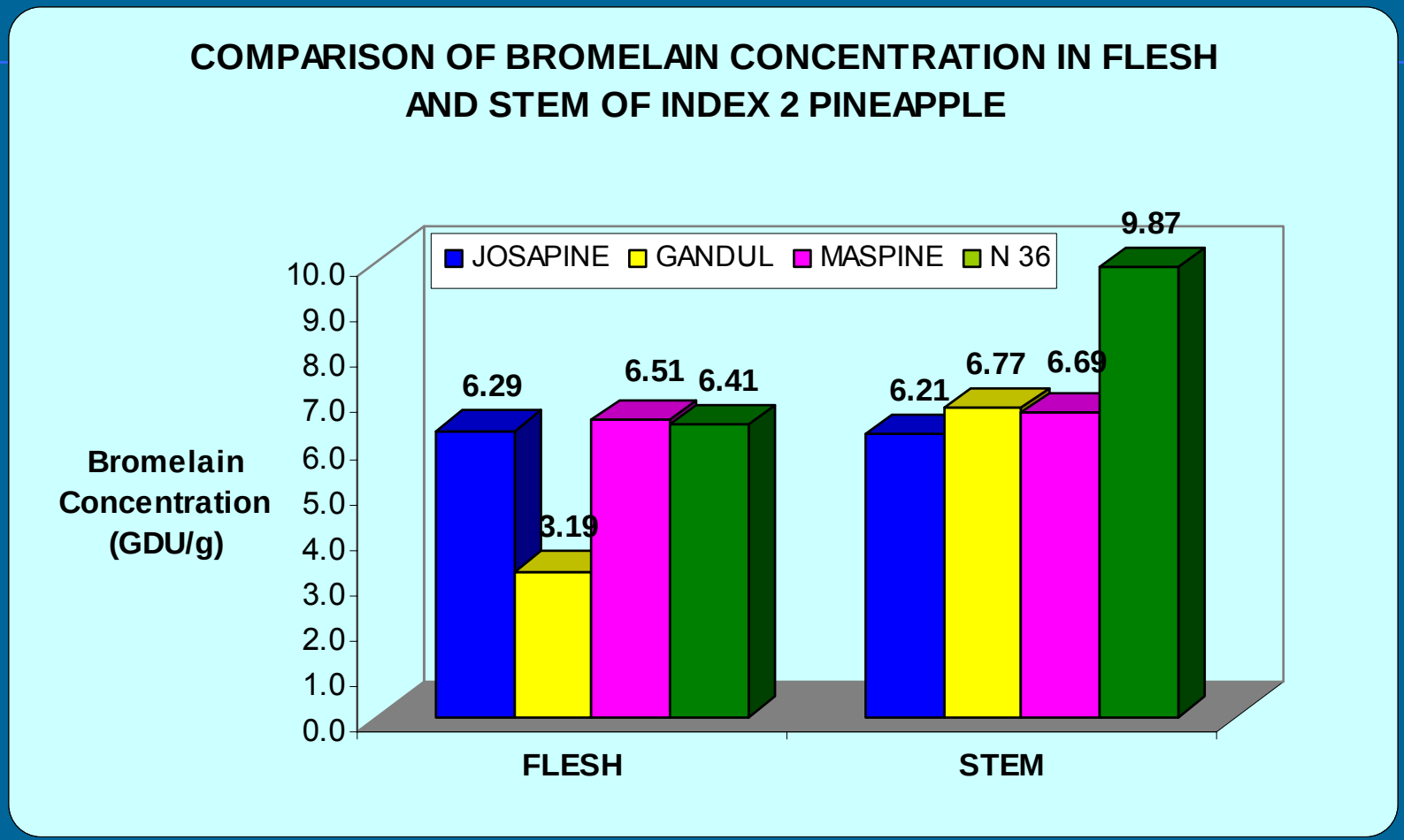
A) GELATIN DIGESTION UNIT (GDU) ANALYSIS

- Conducted in order to determine the enzyme activity [5]
- Pineapple juice will cause the gelatin to stay in liquid state.

B) BUIRET PROTEIN ASSAY

- The principle Buiret assay is to determine the protein content of an unknown.
- The quantity measured in a protein assay is absorbance of light.
- Sample with known amounts of protein and comparing their absorbance with the unknown sample. [11]

RESULT



Sampling: n = 2

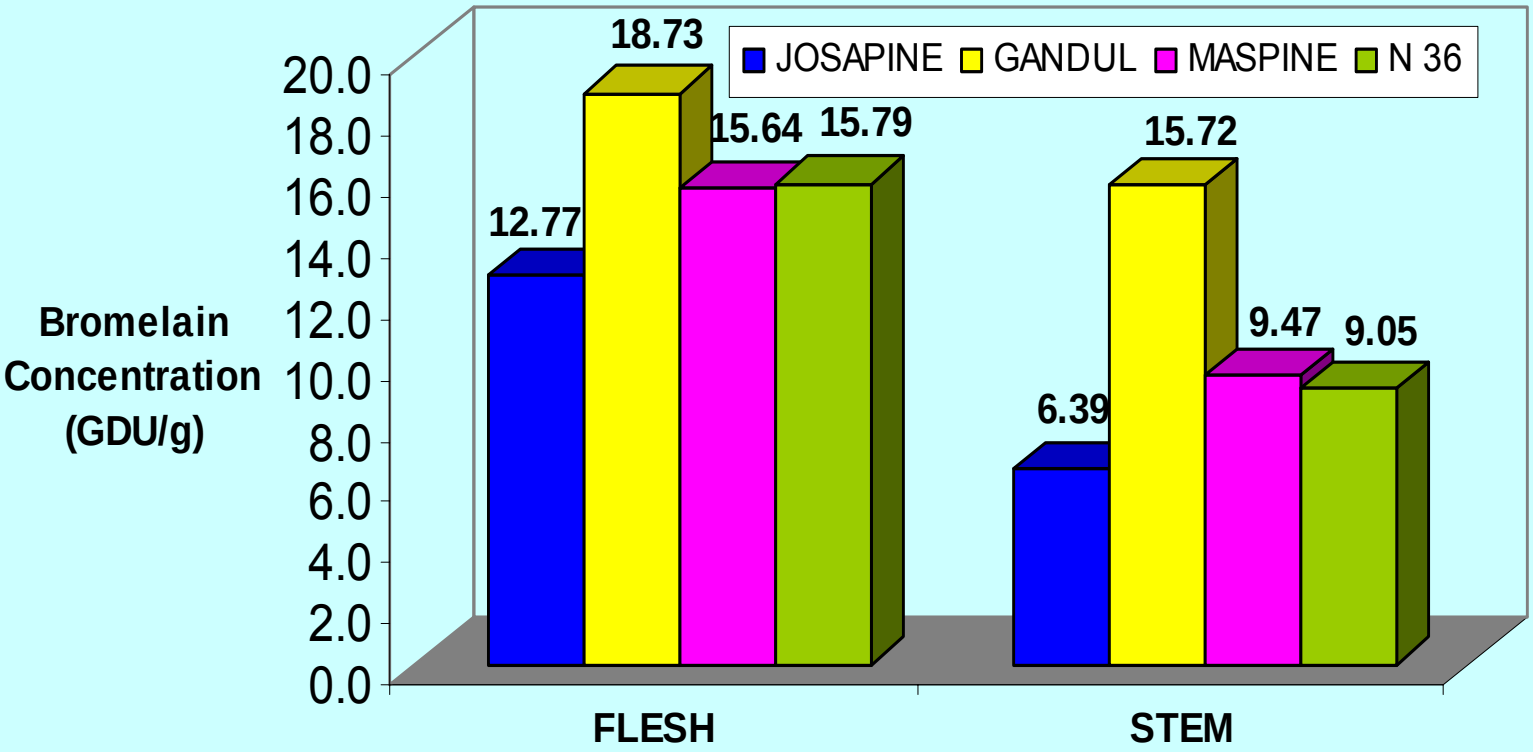
From the chart,

- It is obvious that ***Gandul*** and ***N 36*** have ***high bromelain concentration in stem*** at index 2.

However,

- ***Josapine*** and ***Maspine*** have almost the ***same concentration of bromelain*** either in flesh or stem.

COMPARISON OF BROMELAIN CONCENTERATION IN FLESH AND STEM OF INDEX 4 PINEAPPLE

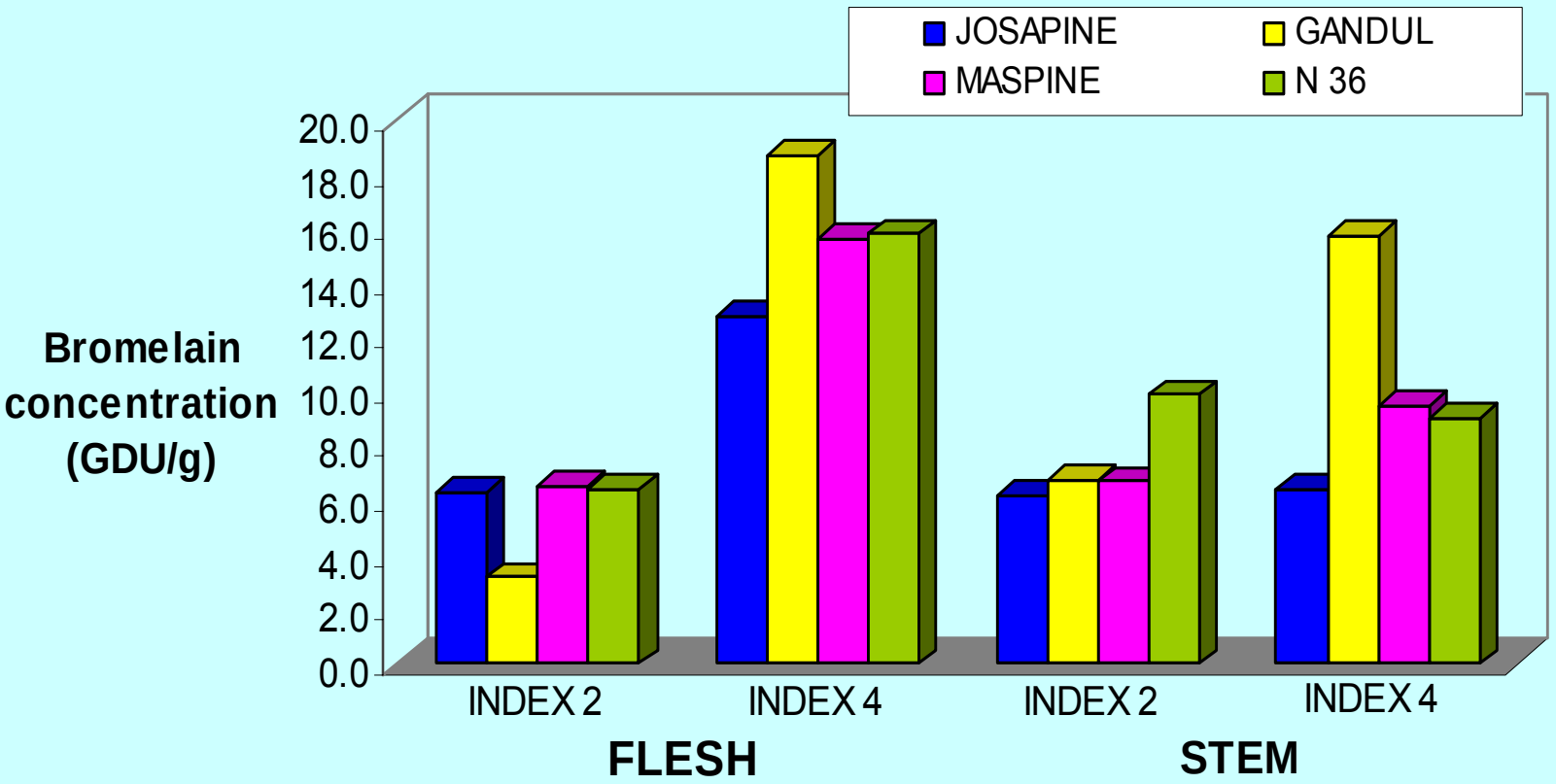


Sampling: n = 2

From the observation,

- It is clear that at index 4, bromelain concentration is ***higher in the flesh*** compared to the stem.
- Bromelain concentration in Josapine, Maspine and N 36 are found to be ***≈50% less*** in the ***stem***.
- While in Gandul, the bromelain concentration is ***≈20% higher in flesh***.

INFLUENCE OF FRUIT INDEX ON BROMELAIN CONCENTRATION

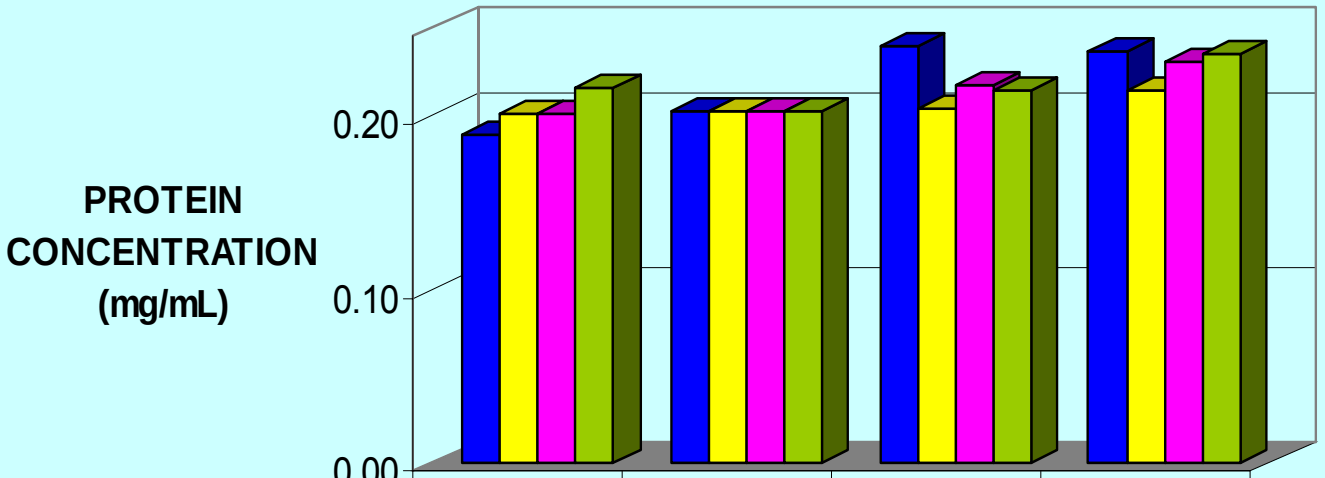


Sampling: n = 2

From the graph,

- Fruit index does influence the concentration of bromelain in pineapples.
- There is a very ***significant increase*** of bromelain concentration in ***flesh*** from index 2 to index 4.
- In ***stem***, bromelain concentration is ***insignificant*** between index 2 and index 4.
- Only the increased of bromelain concentration in gandul's stem are significant from index 2 to index 4.

PROTEIN CONTENT IN VARIOUS PINEAPPLE GROWN COMMERCIALLY IN MALAYSIA



JOSAPINE	0.189	0.202	0.239	0.236
GANDUL	0.201	0.202	0.204	0.214
MASPINE	0.201	0.202	0.217	0.230
N 36	0.216	0.202	0.214	0.235

Sampling: n = 2

Referring to the graph,

- Total protein for both index 2 and index 4 are approximately similar.
- Except for Josapine at index 4, the total protein is higher compare to the others.
- In index 2, the total protein for stem are equal for all variety of pineapple.
- A small increases can be spotted for total protein in flesh and stem of maspine and N 36 in index 4.

CONCLUSION

- Bromelain concentration change with the index.
- Different variety of pineapple have different bromelain concentration.
- Josapine and Maspine in index 2 are relatively having the same bromelain concentration.
  - Could be due the hybridization of Maspine and Josapine.

CONCLUSION

- The concentration of bromelain is found to be higher in the flesh for index 4.
- Gandul has the highest bromelain concentration either in flesh or stem for index 4.
- Different index did not influence the total protein of pineapples.
- Josapine at index 4 has the highest total protein content compare to the other variety.

RECOMMENDATION

- Extract bromelain from cooled pineapple juice by centrifugation, ultrafiltration and lyophilization. [1]
- The bromelain concentration in pineapple juice can precisely calculated by using high performance liquid chromatography (HPLC).
- It is suggested to eat the fresh or frozen (not canned) pineapple to obtain any potential health benefits from proteolytic enzymes in pineapples. [2]

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